Chapter 6

The Southeast Regional Report

THE COMMERCIAL HARVESTING SECTOR

Basic Economic Issues

The Southeast Region of the United States supports a large and diverse harvesting and processing industry for marine fisheries. Fleets in eight states from Texas to North Carolina, Puerto Rico, and the U.S. Virgin Islands land hundreds of species of finfish and shellfish, with the shrimp fisheries by far the most important in terms of total revenues. In 1994, there were about 2.44 billion pounds of landings valued at about $1.03 billion and shrimp accounted for 235 million pounds of the landings valued at $531 million. Other important commercial fisheries include menhaden, blue crab, reef fish, oysters, spiny lobster, mullet, highly migratory species, and coastal pelagics.

The most important factors influencing the economic performance of the commercial fishing industry in the Southeast Region can be categorized as follows:

1) A major portion of the stocks are being harvested at less than their long term potential yield (LTPY) (USDOC, 1993, provides a full definition).

2) Most of the fisheries are overcapitalized in the sense that more harvesting effort than is necessary is employed to catch a given amount of the stock.

3) There are multiple, competing uses of the stocks, and these competing uses complicate management and raise the cost of management.

4) Most of the management regimes for the stocks feature controls, usually overall quotas, that have been largely successful in beginning to halt or reverse stock declines.

5) However, in most cases there are no overall controls on effort and a number of gear, trip limit, size, and other regulations tend to reduce harvesting efficiency and redistribute existing fish stocks with the result of increasing the costs of harvesting, management, enforcement, and monitoring.

6) From a marketing viewpoint, a number of the stocks face market competition from imports of identical or similar species, and prices are often dictated not only by the supply of imported products but by the state of the world economy as well.

7) Probably because the world supply of fishery products cannot be easily increased in response to favorable market signals and because the U.S. demand for seafood products has shifted upwards based on perceived nutritional benefits of seafood consumption, there has been a general tendency for southeastern U.S. seafood prices to increase faster than the rate of inflation. However, a notable exception is that the real price of shrimp has tended to decline in recent years, largely because world shrimp supplies have grown via mariculture.

While some commercial fisheries in the Southeast Region are exclusively or largely the domain of one user group, most fishery resources are exploited by a number of competing commercial and recreational user groups. In heavily utilized open-access fisheries, this leads to allocation problems and a variety of user conflicts that have economic consequences. These issues are difficult to quantify, and as a result it is difficult to address the complex management problems which arise when a diverse group of users with different objectives and harvesting methods are participating in the catch. While most observers tend to think of the competition in terms of the number of harvesters competing directly for the use value of the resources, the finfish bycatch in the Gulf of Mexico shrimp fishery provides a case where the use by one sector, shrimp harvesters, is not intentional. In this particular case, the bycatch is of such magnitude that the stock effects on the finfish resources have profound biological and economic implications for those recreational and commercial fishermen who directly target the bycatch species. For one fishery, red snapper, it has been determined that unless the mortality that results from shrimp harvesting can be decreased by 50%, then the resource cannot recover in any reasonable period of time even if all directed recreational and commercial harvest ceased. (This region's spotlight article provides for a more thorough discussion of

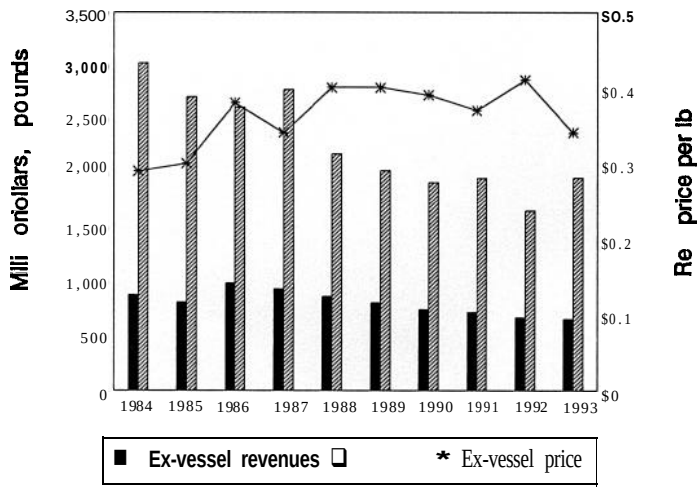


Figure 6-1
Real revenues, landings, and ex-vessel prices for all Southeast fisheries.

A Florida shrimp boat (NMFS photo by William Antozzi).

the management regime for red snapper and how it is impacted by the shrimp bycatch situation.)

As is relatively common in fisheries throughout the United States and the world, the exploitation of open-access marine fishery resources in the Southeast Region has resulted in overcapitalization in the harvesting sector for a number of species. As the term is used here, overcapitalization does not necessarily imply a level of fishing effort that creates a biological overfishing scenario, but instead is meant to imply that effort levels have expanded to the point where a given level of harvest could be produced at a lower cost. The region's shrimp fisheries are prime examples wherein the stocks are not biologically threatened, but where shrimp harvesting effort, by almost any accounting, is far in excess of that needed to harvest the annual shrimp crop. When Ward (1989) compared the optimal fleet size to the actual fleet size in the Gulf of Mexico shrimp fishery, his results indicated that fleet size in the open-access shrimp fishery at that time was more than three times as large as it would be in a controlled-access fishery generating the maximum level of profits. Vessel crowding, often cited as a symptom of overcapitalization, was investigated by Ward and Sutinen (1994) by using fleet size as a measure of the crowding externality (Chapter 1 provides a definition) for the Gulf of Mexico shrimp fishery. One of their main results was that crowding had a highly significant, negative impact on a fisherman's decision to enter the fishery, further indirect evidence supporting the extent of overcapitalization in this fishery.

For most of the period following the implementation of the Magnuson Fishery Conservation and Management Act (MFCMA), fishery managers tended to design and implement regulations that had the major objective of restoring depleted fish stocks or at least maintaining them at current levels. Unfortunately, most of the regulations did not fully address the improvement of net economic benefits which could potentially be derived from the fisheries. In general, the regulations led to shortened fishing seasons, increased capital investment, and an overall decline in harvesting efficiency. However, fishery managers in the Southeast Region are now beginning to take steps leading to the implementation of overall effort controls. Management regulations that attempt to address some of the open-access resource management problems in the Southeast Region began with the imposition of a permit moratorium for the reef fish fishery, which successfully froze entry into the fishery. Following the moratorium, reef fish vessels that were sold with a permit have commanded a $5,000-10,000 premium over vessels sold without the permit. That is, the permit acquired market value, as expected. However, this transferable pseudolicense limitation program did not prevent the expansion of fishing effort by fishermen already in the fishery, nor did it address the derby fishing problem. Noting these outcomes, the Gulf of Mexico Fishery Management Council developed, approved, and is ready to implement an ITQ program for the red snapper fishery.

An ITQ program developed by the South Atlantic Fishery Management Council for the wreckfish fishery has been successful in lowering costs and increasing unit prices as forecast. The wreckfish ITQ program caused fishermen in the fishery to behave as if they owned the resource. While not actually transferring a property right for the resource in the sea to the wreckfish fishermen, fishing effort and participation levels in the fishery have declined over time. Ex-vessel prices have increased with an improvement in the quality of landed fish, and resource rents that were dissipated have been reallocated from the quasi-fixed factor inputs of capital and labor to the relatively more fixed ITQ management instrument.

Beyond these very definitive developments, early discussions by state and Federal management agencies are underway to investigate effort controls for king and Spanish mackerels, deepwater snapper/grouper, spiny lobster, and stone crab. These developments indicate clear progress toward resolving open-access fishery problems in the Southeast and thereby measurably improving the economic status of those fisheries.

As management regimes designed to control overall effort are implemented, the actions should set the stage for an indirect and additional positive outcome in terms of the economic performance and efficiency of the fisheries. This would be manifested by a reduction in the number of regulations that have come into being since the implementation of the Magnuson Act. These other controls, which include trip limits, seasonal closures, area closures, size limits, numerous gear restrictions, income qualifiers, complex reporting requirements, and multiple permits, were successively introduced over a period of years in an attempt to address symptoms of the open-access fishery management problem. It is becoming increasingly clear that although some of the regulations led to demonstrated short-run, positive net economic benefits, in aggregate, the same regulations created conditions which led to a dissipation of the gains with the end result of zero or negative net economic benefits in the fishery after a number of years. Further, it has become almost axiomatic that the regulations tend to foster additional regulations once it is realized that the expected benefits do not appear or are dissipated.

Overview of Southeast Region Fisheries

Figure 6-1 illustrates the trends in real ex-vessel revenues and landings for all Southeast Region fisheries from 1984-93, while Table 6-1 shows 1984-93 landings, real value, and prices for shrimp, menhaden, blue crab, reef fish, oysters, spiny lobster, mullet, highly migratory species (tuna, swordfish, and sharks), coastal migratory pelagics (mackerels and other species), and all other species combined. The named species or species groups accounted for 93% of the landings and 86% of the value of all Southeast Region fisheries in 1993.

Table 6-1
Volume (million pounds), real value (million 1987 dollars), and real price (1987 $/lb) of commercial fishery landings in the Southeast Region[1].

Species	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Shrimp										
Volume	276	292	331	284	251	268	286	266	247	237
Real value	$510	$486	$647	$523	$447	$409	$414	$418	$360	$324
Real price	$1.85	$1.67	$1.95	$1.84	$1.78	$1.53	$1.45	$1.57	$1.46	$1.36
Menhaden										
Volume	2,338	2,053	1,905	2,068	1,485	1,354	1,264	1,332	1,014	1,283
Real value	$102	$74	$72	$73	$73	$51	$45	$53	$44	$50
Real price	$0.04	$0.04	$0.04	$0.04	$0.05	$0.04	$0.04	$0.04	$0.04	$0.04
Blue crab										
Volume	110	102	93	131	135	108	116	125	133	127
Real value	$31	$29	$29	$47	$50	$39	$39	$36	$50	$48
Real price	$0.28	$0.28	$0.31	$0.36	$0.37	$0.36	$0.33	$0.29	$0.37	$0.38
Reef fish[2]										
Volume	33	32	36	37	38	42	43	37	36	40
Real value	$44	$44	$51	$49	$50	$54	$53	$45	$43	$50
Real price	$1.31	$1.40	$1.40	$1.33	$1.31	$1.29	$1.22	$1.20	$1.19	$1.24
Oysters										
Volume	30	28	24	21	19	17	13	13	17	19
Real value	$51	$46	$46	$52	$45	$44	$40	$29	$31	$27
Real price	$1.68	$1.62	$1.93	$2.52	$2.34	$2.58	$3.05	$2.22	$1.83	$1.43
Spiny lobster										
Volume	6	6	5	6	6	8	6	7	4	5
Real value	$17	$15	$14	$22	$17	$21	$18	$23	$14	$15
Real price	$2.76	$2.57	$2.73	$3.61	$2.65	$2.70	$3.00	$3.33	$3.10	$2.73
Mullet										
Volume	27	24	31	29	32	34	36	30	30	37
Real value	$8	$7	$11	$9	$13	$13	$13	$10	$11	$15
Real price	$0.29	$0.29	$0.34	$0.32	$0.40	$0.39	$0.36	$0.32	$0.37	$0.39
HMS[3]										
Volume	8	11	15	23	40	37	30	25	36	30
Real value	$16	$19	$23	$46	$66	$56	$50	$38	$39	$33
Real price	$2.02	$1.80	$1.51	$1.96	$1.66	$1.49	$1.66	$1.50	$1.08	$1.08
CMPS[4]										
Volume	18	17	19	20	19	17	19	20	18	19
Real value	$8	$9	$10	$10	$9	$9	$10	$10	$10	$11
Real price	$0.45	$0.54	$0.52	$0.52	$0.50	$0.53	$0.53	$0.49	$0.53	$0.56
Other										
Volume	186	148	153	161	162	149	108	107	122	170
Real value	$101	$88	$90	$106	$102	$114	$70	$62	$73	$92
Real price	$0.54	$0.59	$0.59	$0.66	$0.63	$0.77	$0.65	$0.58	$0.60	$0.54
Total										
Volume	3,032	2,712	2,613	2,780	2,187	2,034	1,922	1,963	1,659	1,969
Real value	$887	$817	$992	$939	$871	$811	$752	$724	$675	$663

[1]Source: NMFS, Southeast Fisheries Science Center, accumulated landings data file.
[2]Reef fish include snapper, grouper, and other species.
[3]HMS = Highly migratory species include swordfish, tuna, and shark.
[4]CMPS = Coastal migratory pelagic species include king and Spanish mackerel and other species.

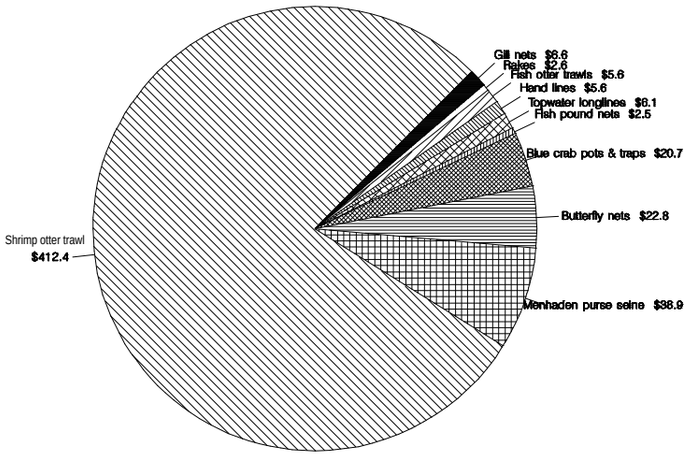


Figure 6-2
Ten most important gear types in Southeast fisheries by revenue earned in 1992.

Table 6-2
Number of fishing craft (vessels and boats) employed in all Southeast fisheries, and number of vessels in the Gulf of Mexico shrimp fishery.

Year	Southeast (all fisheries)	Gulf of Mexico shrimp fishery
1984		5,636
1985		5,670
1986		5,633
1987		5,725
1988		5,897
1989		6,250
1990	37,259	5,828
1991	38,766	5,791
1992	40,204	5,063
1993	41,062	4,928

While it is tempting to look at the overall trends in landings for a specified period of time as an overall indicator of the economic performance of the fisheries, Figure 6-1 and Table 6-1 provide excellent illustrations of the sometimes misleading conclusions that can be reached. For example, while the figure and table indicate that southeastern landings are highly volatile, a closer examination shows that menhaden dominates the landings and menhaden landings have varied by over 100% during the periods examined. Hence, the landings trend is highly misleading. A more realistic picture of economic performance can be gained by examining the economic performance of the individual and collective fisheries, but such an examination requires information on overall effort and the cost of that effort, and such data have only recently become available for the Southeast. The data are now available for the shrimp and reef fish fisheries, but they have not yet been analyzed. The tentative conclusions from the data are that the shrimp fisheries have declined in terms of economic performance over the last 10 years or so. The reef fish fisheries appear to have peaked during the early 1980's in terms of profitability and other economic indicators. Even though the reef fish fisheries may have declined in terms of economic performance since the early 1980's, the Southeast spotlight article indicates that they may improve in the future as forward-looking controlled-access management regimes go into place. As mentioned previously, one of the keys to understanding the economic performance of the fishing industry is to examine effort and the cost of effort. While generic information regarding the overall cost of effort is not available, recent changes in fishing effort levels in the Southeast are suggested by the total number of fishing craft employed. For example, Table 6-2 indicates that the number of craft increased by about 4,000 during 1990 to 1993, and this may indicate a rise in total fishing effort and hence in the total costs of fishing. Once again, though, indicator variables may be misleading. Table 6-2 also shows that the number of vessels engaged in the shrimp fishery appears to be declining.

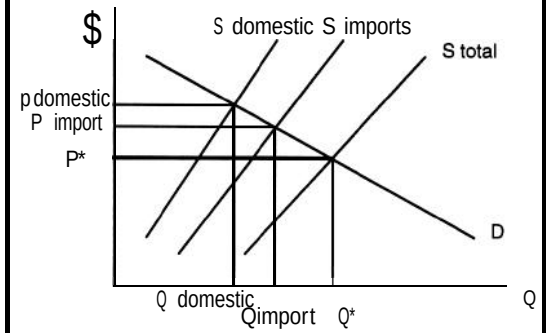
An alternate approach to indicators of fishery performance might be gained via an examination of the gears employed in the fisheries. Figure 6-2 shows the share and revenues generated by the ten most valuable gears used in the Southeast in 1992. The figure clearly indicates that the shrimp otter trawl was the most important fishing gear in terms of the value of landings, and purse seine gear was the leader in terms of volume. Since it has already been established that the shrimp fishery is the most important in terms of value, and the menhaden fishery is the most important in terms of landings, it makes sense that the gear approach may lend additional information about the general state of the fisheries. In particular, note that the shrimp otter trawl gear type generated landings over 10 times more valuable than the menhaden purse seine, the second ranked gear, and 200 times the revenue generated by fish pound nets, the tenth ranked gear in 1992. Similar observations can be made regarding the importance of purse seine gear in the volume of landings.

Given the mixed results in potential trends in overall Southeast landings and value and the indication that total costs of fishing may have increased, it may well be that the net incomes of the average Southeast fishermen have been decreasing in recent years. While NMFS does not collect basic harvesting cost information for all of the affected fisheries, it is likely, or reasonable, to suppose that the profit margins for individual firms may also be declining. For example, a recent economic assessment of the Gulf of Mexico shrimp fishery (Ward and Nance[1]) found a steady decline in net revenue per vessel (see following section for further description).

Regardless of the current and recent overall economic performance and status of the southeastem U.S. fisheries,there has been some degree of success by fishery managers to begin to reverse stock declines. If, as indicated earlier, regulators are now moving in the direction of managing for the longer term economic performance of the fisheries by instituting controls on the overall levels of harvesting effort, the future of the Southeast fisheries possesses the potential for major improvement in net economic benefits over the next 10 years as opposed to the previous years. A caution or caveat is that the effort controls have to be instituted broadly and, at the same time, a number of the current regulations that tend to result in harvesting inefficiencies, while raising the cost of management, have to be removed.

The Southeast Shrimp Fishery

The shrimp fishery in the Southeast Region is considered to be among the most important U.S. fishery resources, and is certainly the most important resource in the Gulf of Mexico. Real ex-vessel prices for shrimp in the Gulf of Mexico increased 86% between 1950 and 1992. However, ex-vessel prices have declined 36% since the 1979 peak, primarily due to a 1,470% increase in shrimp imports. Domestic shrimp landings in the Gulf of Mexico ranged from 134 to 304 million pounds live weight between 1950 and 1992. Landings have gradually increased from an annual average of 196 million pounds between 1950 and 1960 to an average of 274 million pounds between 1984 and 1993 (Table 6-l). In 1991, shrimp landings comprised 15% of total fmfish and shellfish landings, but 57% of its total value. Griffin and Jones (1975) found that the shrimp fishery contributed over $63 million to the Texas economy and supported over 6,000 jobs in 197 1. Kearney/Centau[2] estimated economic impacts for the South Atlantic and Gulf region to be 73,263 jobs generating over $909 million in income and $1.4 billion per year in value added.



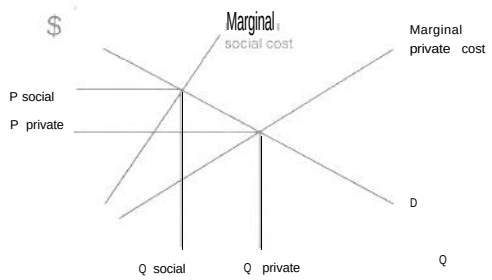
The total supply of shrimp to the U.S. market is the sum of domestic supply and imports. Note that the equilibrium price is much lower than it would be without imports. Shrimp ex-vessel prices have declined 36% since 1979 due primarily to imports.

In the Gulf of Mexico shrimp fishery, vessel fleet size increased until 1989 (Table 6-2). After 1989, vessel fleet size began to decline, probably due to the decline in ex-vessel prices and a decline in average net revenue per vessel. Crew size in the Gulf of Mexico shrimp fishery remained relatively stable at about 2.5 crew members per vessel prior to 1989. After 1989, with the decline in fleet size, crew size per vessel began to increase, exceeding 2.6 in 1992. While these changes in fleet size and crew levels are generally believed to be caused by shifts in relative abundance of different species of fish, ex-vessel prices, and variable costs, explaining these trends with any certainty is not possible at this time.

The shrimp fishery has faced and is facing a unique set of problems. The open-access nature of the fishery led to a decline in vessel productivity

[1]Ward, J. M., and J. Nance. 1994.1994 update to the stock assessment and fishery evaluation (SAFE) report for the Golf of Mexico shrimp fishery. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office. 9721 Executive Center Drive, North, St. Petersburg, FL..

[2]Kearney/Centaur. 1984. Economic impact of the commercial fishing industry in the Gulf of Mexico and South Atlantic regions. Gulf S. Atl. Fish. Develop. Found., Inc., Final Rep . 202 p.



Shrimp bycatch: There is a divergence between the social and private costs for shrimp fishing since the bycatch costs are not included in the cost of harvest. If the total costs were considered, less shrimp would be caught and a higher price would be paid.

that was documented as early as the late 1950's (Osterbind and Pantier[3]). Marine turtle and finfish bycatch is indirectly caused by the open-access nature of the fishery. Turtle excluder devices (TED's) were developed to comply with the requirements of the Endangered Species Act. Bycatch reduction devices (BRD's) are a proposed method to reduce the incidence of finfish bycatch in shrimp trawls. However, Ward and Macinko4 demonstrated that the BRD's alone will not lead to the conservation of finfish stocks in open-access fisheries. Lastly, the development and adoption of fishery management plans for shrimp (Texas Closure) and other species since 1980 and the closure of the Mexican shrimp fishing grounds due to the adoption of a 200-mile limit (Griffin and Beattie, 1978) have led to the reallocation of fishing effort between fisheries and between fishing grounds (Fonyo et al.[5]) that has increased competition for limited domestic supplies of shrimp.

External economic influences have also impacted the shrimp fishery. Accompanying the decline in real ex-vessel prices has been an increase in real input costs since the late 1970's. Fuel prices increased substantially in the early 1970's and had a significant impact on shrimp vessels' variable costs and net revenues (Griffin and Nichols, 1976). By 1980, the extension of Mexico's jurisdiction to 200 miles eliminated access to shrimp fishing grounds that had been heavily utilized by U.S. shrimp fishermen (Blomo et al., 1978). Lastly, the expansion in shrimp aquaculture and imports of shrimp to the United States have depressed ex-vessel prices shrimp fishermen receive for their catch (Vondruska[6]) and even stimulated the creation of a futures market for shrimp.

ITQ's in the Wreckfish Fishery

After a period of unrestricted development in the South Atlantic wreckfish fishery, concerns were expressed that the stock may have already or soon would become overexploited. Regulations establishing a total allowable catch (TAC) were quickly followed by trip limits and a closed season to protect spawning stocks. However, these types of fishery management regulations tend to encourage increased capitalization of the fishing fleet. Management regulations that would encourage efficient harvesting operations were sought to reduce capitalization and participation in the fishery; consequently, individual transferable quotas (ITQ's) were suggested and adopted as a management option beginning in January 1992. Because the wreckfish fishery was believed to be a single-species fishery operating in a small, well-defined area, with no recreational fishery component, a small number of commercial fishermen, and little or no bycatch of other species, it appeared to be an excellent candidate for an ITQ fishery management program.

By most accounts, the program has been successful. The fishing effort level at the beginning of the fishing season has decreased (Fig. 6-3). The number of fishermen in the fishery has declined from 49 initial shareholders to 26 as of May 1994. The number of trips per month has also declined since the ITQ system was implemented. This is directly related to the reduced number of vessels now participating in the fishery. Monthly trips were fairly constant during the last 5 months of the 1993-94 season.

Average ex-vessel prices have increased since the ITQ system was implemented (Fig. 6-4), per-

[3]Osterbind, C. C., and R. A. Pantier. 1965. Economic study of the shrimp industry in the Gulf and South Atlantic states. Final Rep., Contr. 14-17-008-l 18, to Bur. of Commer. Fish, Fish Wildl. Serv., Wash., D.C.

4Ward, J. M., and S. Macinko. 1993. Using theory: rethinking fisheries bycatch problems. Pap. pres. at Int. Conf. Fish. Econ., Os, Norw., May 26-28.

[5]Fonyo, C. M., J. A. Browder, and S. L. Brunenmeister. 1983. Dynamics of the Gulf of Mexico shrimp fleet, 1981. U.S. Dep. of Commer., NOAA, Natl. Mar. Fish. Serv., 7.5 Virginia Beach Drive, Miami, Fla.

[6]Vondruska, J. 1992. Southeast shrimp fishery market conditions, 1991-1992. Natl. Mar. Fish. Serv., Southeast Reg. Off., Dec., Prelim. Draft Report, 16 p.

haps reflecting the improved quality of wreckfish landings under the ITQ program. The 1993-94 season experienced relatively constant monthly prices, an indication that some level of stability has been attained in terms of a better match between seasonal demand and supply.

Monthly landings do exhibit less variation under the ITQ program. The total catch for each season has declined since the ITQ was adopted (Fig. 6-5). Various factors not necessarily related to stock density could be responsible for the decline in total catch during each season. At present, only assumptions can be made as to the reasons for the decline. However, catch per unit of effort has not declined in the fishery since the adoption of ITQ's. Figure 6-6 shows that landings during the first month of fishing were much lower for the two seasons after implementation of the ITQ program than landings before ITQ's were adopted (the 1991-92 season), indicating that a solution to the race for fish has been found.

The utilization rate of ITQ shares seems to be increasing. Table 6-3 shows a breakdown of how shares were utilized by the shareholders. During the 1991-92 season (pre-ITQ), 91 wreckfish vessel permits were issued, and of those, 44 reported wreckfish landings. The number of permits issued dropped to 40 for the 1992-93 season with 22 reporting landings, and to 23 for the 1993-94 season with 19 reporting landings. Twenty-one vessels were issued permits for the 1994-95 season, and so far 11 have reported landings. There has been a net change of 23 shares in 22 transactions from April 1992 to May 1994. Twenty-nine shareholders have sold their shares and six shareholders have entered the fishery. The value of the permanent ITQ shares and annual coupons is currently estimated at nearly $1 million. This figure represents the net present value of the stream of net revenues the fishery is capable of generating over time.

Table 6-3
Utilization of ITQ shares by shareholders.

Item	1992-93	1993-94
Number of active shareholders	38	26
Didn't use shares	26%	23%
Used 1-50% of shares	21%	23%
Used 51-99% of shares	11%	31%
Used 100+ % of shares	16%	8%
Sold shares	26%	15%

With the initial allocation of ITQ's to fishermen based equally on harvest history and participation in the fishery, those fishermen who elected to exit the fishery were compensated by those fishermen who desired to remain in the fishery or who wished to enter the fishery. Under the ITQ program, the "winners" compensated the "losers" as the fishery was transformed from a common property resource to one in which fishermen behaved as if property rights for fish in the sea existed.

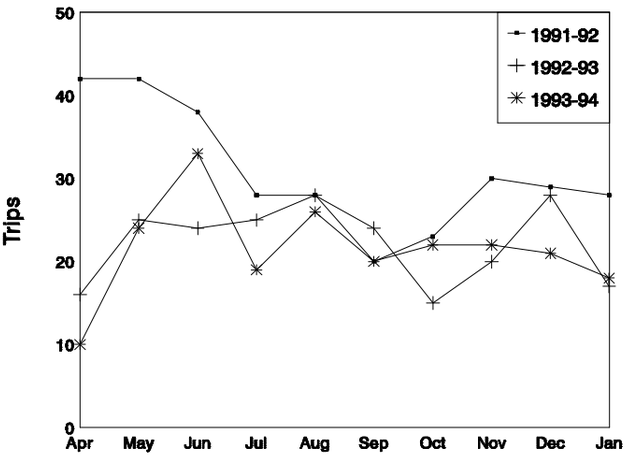


Figure 6-3
Number of wreckfish trips.

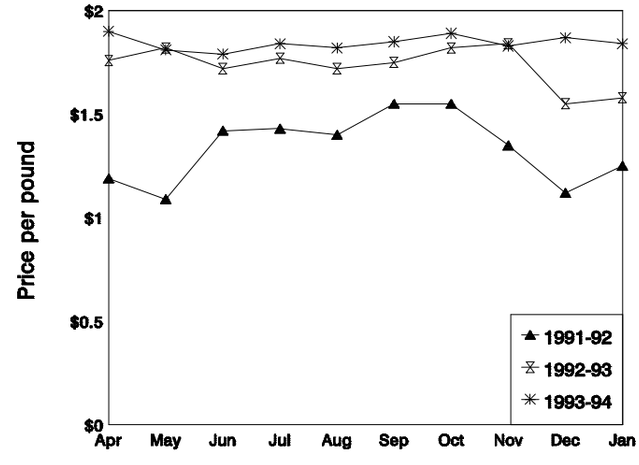


Figure 6-4
Ex-vessel prices of wreckfish.

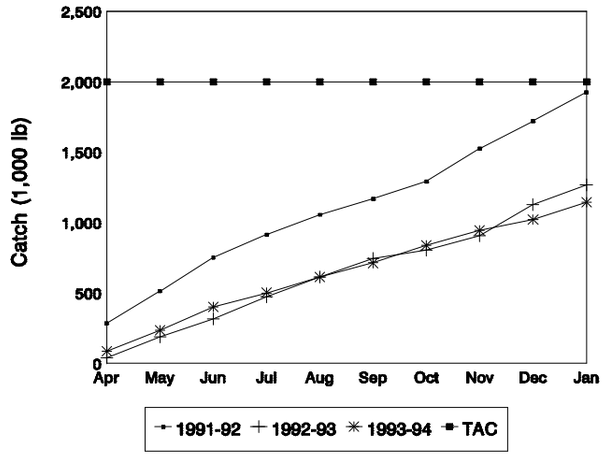


Figure 6-5
Accumulated wreckfish catch by season (whole weight).

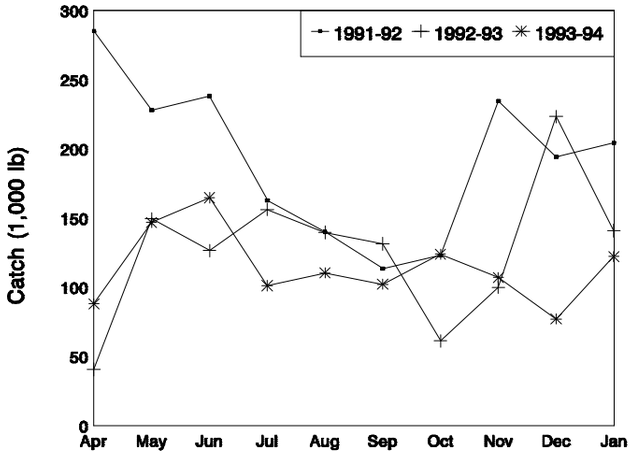


Figure 6-6
Wreckfish catch by season (whole weight).

That winners compensate the losers without government interference is an important outcome of ITQ management programs.

The ITQ program has indicated two key issues with ITQ management. The first issue is the importance of the setting of the TAC. While TAC was nearly achieved prior to the ITQ program, it has not been approached since the adoption of the ITQ program. Since the TAC determines the total supply of ITQ coupons, an excess supply will act to depress ITQ prices. Lower ITQ prices will attract entrants to the fishery or maintain the fleet at a higher than optimal size. Eventually, improvements in market conditions will result in increased demand for ITQ's and ITQ prices will increase as a result. For new ITQ programs, it is important that TAC levels are set to reflect optimum yield from the fishery to minimize the time it takes to stabilize the market.

The second key issue concerns assumptions on fishermen behavior. It was believed that the wreckfish fishery was a single-species fishery, and the predicted change in fishing behavior as a result of an ITQ program was that individual fishermen would fish less intensely. Diversification of fishing operations to other fisheries was not anticipated. However, fishermen left the ITQ fishery to operate in more profitable alternative fisheries or to establish participation records in other fisheries where ITQ programs were being considered. When the catch rates in these fisheries declined, they returned to the wreckfish fishery. Fishermen in those alternative fisheries had to bear the costs of increased competition for their fixed fishery resource. As a result, the benefits generated in the wreckfish fishery are mitigated by the costs imposed on other fisheries. Better socioeconomic information about the past fishing behavior of fishermen needs to be collected to anticipate the degree of switching behavior induced by the change in management institutions. This information would include the characteristics of the vessel or boat and the fishermen and past economic information on revenue and variable costs on an individual firm basis.

Overall, the wreckfish fishery is behaving like a competitive market. The externalities of resource rent dissipation and fleet overcapitalization have been corrected by eliminating the open-access market failure. With use rights in a free and competitive market, fishermen can make long-run investments in the form of stock conservation. The vesting of fishermen means that management regulations can be less stringent and less costly to implement, monitor, and enforce.

THE SEAFOOD PROCESSING SECTOR

Overview

Fish processing in the southeastern coastal states from North Carolina to Texas involves several major species and numerous individual products. Southeast fish processing companies serve markets that extend well beyond the region, but the sales of some products are essentially determined by the regional yield, seasonality, and volatility of Southeast fisheries. For the most part, these fisheries are fully developed, and some are considered biologically overfished. To address this, state and Federal fishery management regulations have reduced total allowable catch, brought seasonal and area fishing closures, and allocated catch between recreational and commercial fishermen, all of which may affect the flow of raw material to processors and disrupt their activity for some products.

In some instances, processing companies use imported fish to overcome the effects of regional fishery supply limitations on their viability, growth, and capability to serve and maintain the markets they have developed. An established market, customer base, proprietary brands, and company reputation are valuable intangible assets to a processing business. Specific product availability and price are frequently cited problems for processors, according to surveys of buyers and sellers. Imports may add stability and preclude disappearance of the market for an item, although temporary market gluts (for fresh fish) may result if domestic fisheries are reopened without effective controls on effort.

Table 6-4 lists nine of the most important Southeast Region processed product categories in 1993 (in order of real value): shrimp, farmed catfish, blue crab, menhaden, oysters, freshwater crawfish, spiny lobster, reef fish, and coastal migratory pelagic fish. For each of these categories, the Southeast accounts for much of the U.S. output, though imports may add greatly to the U.S. market supply for some items. For a few items, exports are significant when compared with Southeast production or U.S. market supply. Shrimp, menhaden, farmed catfish, and oysters will be discussed in more detail in subsequent sections.

The total volume and real value of output in southeastern coastal states have trended downward in the past decade, largely reflecting the decreasing volume of menhaden and the declining

Table 6-4
Volume, real value, and real price per pound of processed products in the southeastern United States[1].

Species	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Shrimp										
Volume[2]	253	257	292	264	276	290	312	276	262	269
Real value[3]	$1,065	$991	$1,142	$1,015	$897	$972	$928	$802	$721	$708
Real price[4]	$4.22	$3.85	$3.90	$3.84	$3.25	$3.35	$2.98	$2.90	$2.75	$2.63
Blue crab										
Volume	38	41	39	38	35	32	32	34	31	34
Real value	$118	$113	$113	$112	$101	$99	$100	$85	$84	$95
Real price	$3.09	$2.78	$2.90	$2.93	$2.88	$3.13	$3.17	$2.51	$2.69	$2.78
Oysters										
Volume	26	28	21	18	17	13	12	10	11	13
Real value	$76	$78	$65	$59	$58	$44	$37	$28	$31	$31
Real price	$2.91	$2.82	$3.04	$3.36	$3.39	$3.43	$3.09	$2.84	$2.74	$2.36
Spiny lobster										
Volume	4.7	3.1	3.3	2.5	4.1	2.5	2.8	3.6	2.9	2.5
Real value	$27	$16	$19	$15	$20	$12	$17	$19	$20	$16
Real price	$5.85	$5.15	$5.83	$6.14	$4.87	$4.67	$5.93	$5.40	$6.86	$6.24
Coastal pelagics										
Volume	0.6	1.8	1.3	0.8	1.8	1.7	2.2	2.6	2.1	2.1
Real value	$1	$3	$2	$3	$4	$4	$5	$5	$5	$5
Real price	$2.11	$1.66	$1.62	$3.07	$2.22	$2.10	$2.21	$2.06	$2.39	$2.48
Reef fish										
Volume	1.5	2.1	3.0	2.8	3.2	3.0	3.5	3.7	3.8	3.8
Real value	$7	$9	$15	$16	$15	$14	$16	$16	$15	$16
Real price	$4.86	$4.24	$4.96	$5.52	$4.64	$4.59	$4.61	$4.32	$3.97	$4.16
Crawfish										
Volume	1.6	2.8	4.8	4.4	4.1	9.6	4.6	5.1	8.7	10.3
Real value	$10	$12	$20	$15	$16	$38	$16	$15	$26	$26
Real price	$6.27	$4.09	$4.17	$3.52	$4.04	$3.99	$3.47	$2.92	$3.00	$2.54
Menhaden										
Volume	1,226	1,113	917	1,000	947	903	924	910	674	906
Real value	$189	$141	$132	$157	$166	$119	$108	$110	$90	$105
Real price	$0.15	$0.13	$0.14	$0.16	$0.17	$0.13	$0.12	$0.12	$0.13	$0.12
Catfish										
Volume	82	99	114	147	150	176	183	200	231	233
Real value	$144	$174	$230	$283	$318	$343	$360	$354	$383	$411
Real price	$1.76	$1.75	$2.02	$1.93	$2.13	$1.95	$1.96	$1.77	$1.66	$1.76
Total										
Volume	1,525	1,320	1,406	1,356	1,156	1,086	1,056	1,092	902	1,109
Real value	$1,692	$1,494	$1,674	$1,549	$1,399	$1,409	$1,323	$1,156	$1,085	$1,112
Real price	$1.11	$1.13	$1.19	$1.14	$1.21	$1.30	$1.25	$1.06	$1.20	$1.00

[1]Sources: NMFS data for categories excepting farmed catfish is for production; USDA (1994) data for farmed catfish is for sales. Coastal migratory pelagic fish include king and Spanish mackerel, notably, while reef fish include snappers and groups primarily. The total includes menhaden, but not farmed catfish products.
[2]Volume in million pounds, product weight.
[3]Real value in millions of dollars.
[4]Real price per pound, product weight.

value of shrimp. Even after adding farmed catfish, which experienced significant growth, the total real value dropped nearly 17% during 1984-93 (Table 6-4). In comparison, U.S. value of all seafood increased 8%. It should be noted that production and sales at the processor-wholesaler level in the marketing chain may not be accurately reflected in Table 6-4, as the NMFS Annual Survey of Processors provides data on output, but not sales, inventories or purchases of fish. Also, data on the flow of fish (including some processing) via separate wholesaling companies are not obtained in the NMFS Survey[7].

The number of fish processing plants in southeastern U.S. coastal states was lower in 1993 than 1984 (excluding data for farmed catfish). Employment was also lower, as shown below.

	1984	1993
Average value of output per plant	$2,480,000	$1,890,000
Average monthly employment	17,500	13,472
Seasonal peak in employment	18,147	14,557

Shrimp Processing

Compared with the growth in U.S. consumption of shrimp from 388 million pounds (heads-off) in 1984 to 688 million pounds in 1993, U.S. and Southeast processing plant output has been relatively flat in terms of volume, while real value has declined. The real average "price" (real average unit value) for all Southeast-processed shrimp products declined from $4.22 per pound in 1984 to $2.63 in 1993. The real price of shrimp has exhibited a downward trend since the late 1970's, because world supply has grown faster than world demand, due primarily to farming of shrimp, mostly in countries with suitable sites in tropical climate zones.

Most of the growth in U.S. consumption of shrimp is attributable to three product forms (raw headless, raw peeled, and cooked peeled shrimp), and imports of these products may be marketed to the retail sector with very little value added from processing in the U.S. "Apparent" consumption (market disappearance) is a measure of market size, computed from NMFS published data on U.S. production, foreign trade, and cold-storage holdings, and represents product flow roughly at the processor output level. Actual human intake, household purchases, and household use are measured in special surveys.

The value added in processing is much higher for breaded and canned shrimp than for raw headless, raw peeled and cooked peeled shrimp, but much of the growth in processor-level demand for them appears to have been achieved by the 1970's. When breaded shrimp and other breaded seafood products were introduced shortly after World War II, the use of frozen food was less prevalent than it is today. Seafood markets were also more regional (coastal) in scope, except for a few canned items, notably salmon, sardines, and tuna (in order at that time). Breaded shrimp and other breaded seafood products represented an innovative concept in convenience and portion control for the food service trade; along with counterparts for retail food stores, they added more of a national scope to the market for seafood. Today, even restaurants that are located far inland may offer menu items based on air-transported fresh seafood, or they may use prepared entree, "convenience," custom, and other "value-added" packs from processors; alternatively, some may choose to do their own shrimp breading.

While imports continue to represent a small fraction of the U.S. market for breaded shrimp, the same cannot be said for canned shrimp. There was once much U.S. canning of small shrimp, and the nation was a net exporter (exports exceeded imports) between 1965 and 1981, after which imports exceeded exports. The venerable U.S. canning industry dwindled amidst new competition from Southeast Asian packers, and by the early 1990's the U.S. pack was less than a million pounds, a fraction of what it once was. In the past few years, imports have fallen as well. The fall in imports implies lower U.S. consumption and reduced market demand, given that inventories of canned shrimp did not decrease at the same time. Overall, there has been growth in demand for shrimp, but a gradual shift in preferences from

[7] NMFS. 1994. Unpublished, summarized data from the annual surveys of fish processing plants for 1984-93. U.S. Dep. Commer., Natl. Mar. Fish. Serv., Fish. Stat. Div., Silver Spring, Md.

canned and cured (dried) to fresh and frozen product forms. Therefore, U.S. landings of smaller shrimp are now far more likely to be peeled and frozen rather than peeled and canned. Smaller shrimp comprise a significant proportion of shrimp landed in the Southeast Region; this is especially true of Louisiana landings.

Menhaden Processing

In terms of volume, menhaden is the Southeast's leading species category at the harvesting and processing levels; its main products include fish meal, oil, and solubles. Although these products are sometimes viewed as industrial or inedible in nature, menhaden oil has been mostly exported to Europe for many years for use as a human food ingredient. More recently, such use has been approved for the United States. As with most other oils, there are both edible and inedible uses for menhaden oil. Menhaden fish meal and solubles provide nutritionally high quality ingredients in livestock, fish, and other animal feeds. Depending on international market conditions, the United States may be a net importer or exporter of fish meal. Though the major menhaden processing companies are few in number (possibly suggesting some influence of an oligopolistic market structure on prices), the prices the companies receive for their products are determined in very competitive and complex international markets for numerous meals, fats, and oils, most of which are of agricultural origin.

Because of confidentiality of data, U.S. menhaden data are shown as a whole in Table 6-4. Menhaden is processed mostly in Louisiana, Mississippi, and Virginia, and, to a lesser extent, in North Carolina. There has been some harvesting and processing of menhaden as far north as Canada and the Gulf of Maine, depending on water temperatures and other factors that affect fish availability along the coast (Smith et al.[8, 9]). Viewed over the long term, processor companies have adjusted activity (plants, boats, and fishing effort) in accordance with the cycles in the sizes of the separate Atlantic and Gulf menhaden fish stocks. The Gulf catch has been larger since the early 1960's and was unusually high in most years during 1978-87 because of very good environmental conditions. Gulf landings reached 983,000 t in 1984, but fell to 421,000 t in 1992, and recovered somewhat to 539,000 t by 1993. The Atlantic catch dropped significantly in 1992 as well. The fluctuations in landings are reflected in processor output.

Farmed Catfish Processing

Among the species categories in Table 6-4, the strongest upward trends in processed output in the Southeast are for catfish and crawfish, for which raw material supplies are dependent largely (catfish) or in part (crawfish) on Southeast freshwater fish farming operations rather than harvesting wild fish (USDA, 1994). Freshwater catfish are farmed and processed largely in inland areas of southeastern coastal states. Using national totals, processor sales of pond-raised catfish have grown sharply, from 2.8 million pounds in 1970 to 27.8 million pounds in 1980, 183 million pounds in 1990, and 233 million pounds in 1993 (USDA, 1988, 1994). In 1993, the real value of processor sales was $411 million, putting catfish second only to shrimp in terms of value of sales. The growth in sales exceeds that for most fisheries, partly because of the lack of resource constraints with wild fish stocks. Also, aquaculture operations can provide year-round supplies, and specific quality and appearance attributes that may not be possible with wild fish. Of course, fish farming is not without problems. Import competition was once a concern, but imports have been on a downward trend from a peak of 18 million pounds in 1978 to about 4 million pounds in 1993, and the industry is exploring the potential for increasing its yet small exports. Among other concerns, there will always be the need to keep costs competitive, and increasingly stringent effluent standards will require methods of reducing waste discharge from aquaculture operations.

[8]Smith, J. W., and Menhaden Team. 1994a. Status of the menhaden fisheries: a report to the National Fish Meal and Oil Association, San Diego, California, November 1994. U.S. Dep. Commer., Natl. Mar. Fish. Serv., Beaufort, N.C.

[9]Smith, J. W., and Menhaden Team. 1994b. Preliminary forecast for the 1995 Gulf and Atlantic menhaden purse-seine fisheries and review of the 1994 fishing season. U.S. Dep. Commer., Natl. Mar. Fish. Serv., Beaufort, N.C., Dec.

Table 6-5
Real value and volume of shrimp imported to the U.S., by country of origin.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Thailand										
Value[1]	56	63	62	64	88	172	221	367	434	565
Volume[2]	8	11	11	11	11	22	25	45	54	67
Ecuador										
Value	204	176	287	378	368	284	257	308	313	298
Volume	21	20	28	46	47	37	38	49	55	49
Mexico										
Value	410	314	342	401	299	263	156	154	121	170
Volume	37	31	34	39	29	27	17	17	14	20
China										
Value	14	23	65	119	289	255	314	186	263	148
Volume	1	3	9	19	47	47	57	35	49	31
Indonesia										
Value	9	6	8	12	17	48	66	90	101	89
Volume	1	1	1	2	2	6	9	12	14	13
India										
Value	45	45	48	57	53	48	50	57	50	66
Volume	10	11	11	13	15	13	14	18	18	19
Bangladesh										
Value	13	14	20	32	49	42	50	31	56	64
Volume	1	2	3	4	5	6	7	5	8	10
Honduras										
Value	19	19	26	28	31	23	25	36	44	54
Volume	2	2	3	4	4	3	4	6	8	10
Panama										
Value	68	72	80	70	55	63	36	40	40	41
Volume	7	9	10	8	7	8	5	6	5	6
Brazil										
Value	67	72	68	51	57	38	19	20	29	23
Volume	9	11	9	8	9	8	4	4	6	4
Colombia										
Value	20	14	19	20	18	24	28	31	20	21
Volume	2	2	2	2	2	3	4	5	3	3
Philippines										
Value	10	21	21	26	36	52	38	49	33	20
Volume	1	2	2	3	3	6	5	6	4	3
Others										
Value	402	382	435	452	329	260	205	207	165	187
Volume	55	58	59	58	48	42	38	37	32	38
Total										
Value	1,337	1,221	1,481	1,710	1,689	1,572	1,465	1,576	1,669	1,746
Volume	155	163	182	217	229	228	227	245	270	273

[1]Real value is given in millions of dollars.
[2]Volume is given in thousands of metric tons.

Oyster Processing

Although there is some element of aquaculture (or at least enhanced natural production) associated with the oyster fishery, the strongest downward trend evident in Table 6-4 is for this species, and it appears to be related to a complicated set of factors concerning resource abundance and market demand. Southeast oyster landings were relatively high in 1984-85 and they recovered more in the early 1990's than is suggested by the processing sector data in Table 6-4. It is possible that this difference in trends could be explained by the shipment of shellstock (sacks of live oysters) out of the Southeast Region to the Chesapeake Bay for shucking, or to the fact that more live oysters are being marketed directly to consumers. U.S. landings of Eastern oysters were substantially lower in 1993 than in 1984 because of a sharp drop in landings in the Chesapeake Bay, where two recurring oyster diseases, MSX and *Dermo*, reached proportions great enough to reduce significantly the stock of living oysters. However, total U.S. landings of oysters have been declining for decades.

Currently, Southeastern U.S. resource conditions are thought to be relatively good, but there is concern within the trade about market demand (McAvoy[10]), which has been affected by publicity about possible effects of consuming raw oysters. There are requirements by some states that sacks of shellstock have warning labels about the virus *Vibrio vulnificus* and that restaurant or "raw bar" menus have similar warnings. Serious human illness can occur in individuals with compromised immune systems if *Vibrio* is ingested with raw oysters. Reportedly, there are some 15 deaths a year in the United States from this virus. More prevalent and far less serious incidences of human illness can be traced to the ingestion of raw oysters from waters contaminated by fecal coliform and Norwalk bacteria, but tests are available only for the former. The presence of fecal coliform bacteria has long been a primary indicator in the classification of molluscan shellfish-growing waters for harvesting, including their closure as necessary, by state health agencies in accord with the National Shellfish Sanitation Program's guidelines. The industry is currently exploring new tech-

[10]McAvoy, H. 1995. Fla. Dep. Agric., Fla. Bur. Seafood Market., Wilder Off. Cent., 3000 Gulf to Bay Blvd., Suite 402, Clearwater, FL 34619. Personal commun.

niques, such as depuration and irradiation, which may have implications for its variable costs.

THE SEAFOOD TRADE SECTOR

Important Species in the Southeast Region

Shrimp: Shrimp is one of the most popular seafoods in the United States. Over the last 10 years, consumption has risen from 2.5 pounds per capita in 1984 to a record high of 3.3 pounds per capita in 1993. Increasing world supplies, largely due to burgeoning shrimp culture, have made shrimp plentiful and helped keep prices low. In fact, in real dollars, shrimp is 23% cheaper per pound in 1993 than it was in 1984. Imports of all forms of shrimp by the United States, the world's biggest shrimp market, have fluctuated in value between $1.2 and $1.7 billion (in 1993) over the 10-year period 1984-93 (Table 6-5).

The volume of imported shrimp has steadily grown over the 10-year period, reaching a record 273,000 metric tons (t) in 1993, four times as great as domestic shrimp landings. Of the two predominant categories of imported shrimp, "raw headless shrimp" imports have been declining while "raw peeled shrimp" imports have been increasing.

Thailand, Ecuador, Mexico, China, and Indonesia were the five major suppliers (in terms of value) in 1993 (Fig. 6-7, 6-8). Notably, all but Mexico are major shrimp culturing countries. Thailand's rise to the top over the last 10 years has been dramatic. The value of shrimp imports from there rose from a mere $56 million in 1984 to $565 million in 1993. Most of Thailand's production is farmed black tiger shrimp.

Ecuador is a pioneer in the shrimp farming business and was producing substantial quantities of cultured shrimp as early as 1984, when U.S. imports of Ecuadorian shrimp were worth $204 million. The 1993 imports, valued at $298 million, were mostly western white shrimp.

Mexico fell from being the leading U.S. supplier in 1984 to third place in 1993, with imports worth $170 million. Mexico, which is dependent on wild-caught stocks, had poor seasons in 1990 through 1992 that depressed U.S. imports. Speculation on reasons for the decline in production include climatic factors, pollution, and overfishing in the estuaries. However, a rebound took place in 1993, a result of good seasons on both coasts and possibly the privatization of the shrimp industry (from the previous cooperative system).

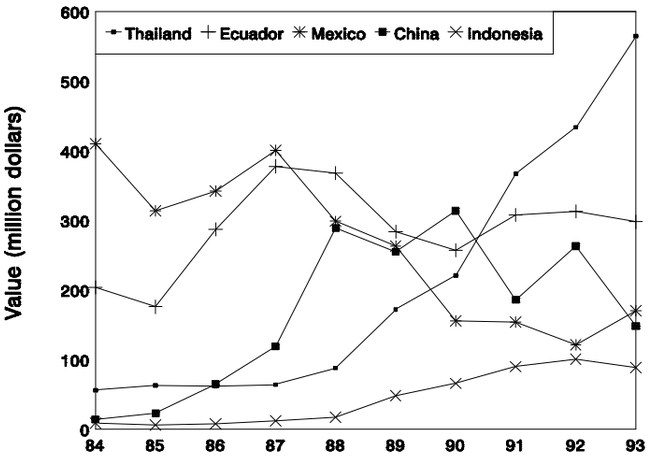


Figure 6-7
Real value of shrimp imports to the Southeast by leading suppliers.

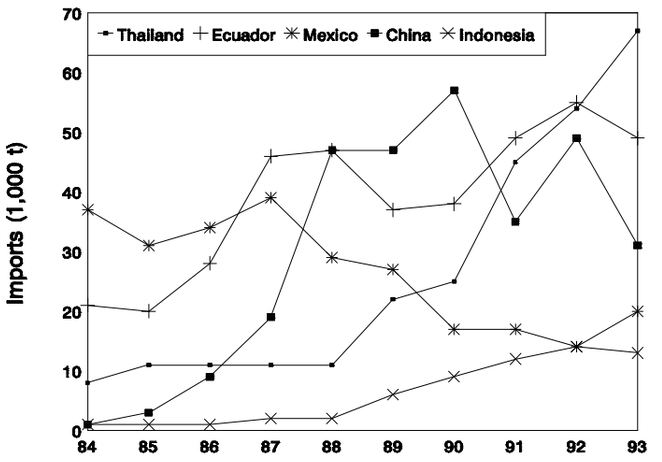


Figure 6-8
Volume of shrimp imports to the Southeast by leading suppliers.

Table 6-6
Southeastern U.S. imports[1] of snapper.

	Imports			Percent
	1991	1992	1993	change
Fresh				
Value	13,608	15,687	15,745	16
Volume	4,895	5,546	6,336	29
Frozen				
Value	1,860	2,337	2,193	18
Volume	761	1,073	956	26
Total				
Value	15,468	18,024	17,938	16
Volume	5,656	6,619	7,292	29

[1]Values are given in thousands of dollars and volume is given in metric tons.

China, which has the only major shrimp culture industry in temperate latitudes, accounted for imports valued at $148 million in 1993, compared to only $14 million in 1984. The cultured shrimp called "China whites" are virtually indistinguishable from the white shrimp produced in the Gulf and South Atlantic. Heavy flooding hit the shrimp farming regions in 1991, reducing production and U.S. imports significantly that year. In 1993, a different disaster hit China's shrimp farms in the form of disease that wiped out many of the shrimp, causing exports to the U.S. to fall precipitously.

Indonesia's dramatic rise to status as a major shrimp producer and exporter is another aquaculture success story. The culturing of mostly black tiger shrimp accounts for U.S. imports exploding from $9 million in 1984 to $89 million in 1993.

Snapper: Imports of all snapper reached a total value of $17.9 million in 1993, up 16% over the 1991 value (Table 6-6). Fresh snapper constituted 88% of the total imports (by value) of snapper, while frozen products made up the rest. The value of fresh snapper imports reached $15.7 million in 1993, an increase of 16% over 1991. The top five sources of fresh snapper, by value, for all three years were Mexico, Panama, Costa Rica, Venezuela, and Nicaragua. Mexico, the leading supplier, accounted for 26% of fresh U.S. imports by value in 1992.

Frozen snapper imports also increased. The 1993 total of $ 2.2 million topped the 1991 total by 18%. The top 1993 suppliers of frozen imports, in order of value, were Thailand, Mexico, Taiwan, India, and Japan. Thailand accounted for 21% of the imports by value.

Table 6-7
Southeastern U.S. imports[1] of grouper.

	Imports			Percent
	1991	1992	1993	change
Fresh				
Value	5,187	7,484	7,557	46
Volume	2,527	3,250	3,141	24
Frozen				
Value	3,239	1,486	957	-70
Volume	1,756	686	480	-73
Total				
Value	8,426	8,970	8,514	1
Volume	4,283	3,936	3,621	-15

[1]Values are given in thousands of dollars and volume is given in metric tons.

The Gulf of Mexico was closed to U.S. commercial red snapper fishing for about 4 months in 1991, 9 months in 1992, and again for 9 months in 1993 for management purposes. This put pressure on U.S. wholesalers to obtain sources of imported snapper, especially to supply those restaurants that carry snapper on their menus.

Grouper: U.S. demand for fresh grouper continues to exceed domestic production, requiring imports of fresh product from Latin American countries. Total grouper imports reached $8.5 million in 1993, up 1% over 1991 (Table 6-7). Fresh grouper comprised 89% of the total imports (by value) in 1993, while frozen made up the rest. The total value of fresh grouper imports reached $7.6 million for 1993, an increase of 46% over the 1991 level.

The top foreign suppliers of fresh grouper for all 3 years, by value, were Mexico, Panama, Costa Rica, Columbia, and Ecuador. Mexico was by far the top supplier, accounting for 48% of the fresh imports in 1993 (by value). However, this was a drop in import market share compared to the 1992 share of 61%, attributable to an increased domestic (Mexican) market. Reportedly, the price offered in Mexico City for grouper is frequently equal to or higher than that offered by U.S. importers. The growing Mexican market stems from greater use by the wealthier socioeconomic classes and the burgeoning tourist industry.

Frozen grouper imports declined dramatically from 1991 levels, down 70% in 1993. The top suppliers in 1993 were Taiwan, Japan, Mexico, India, and Thailand. The leader, Thailand, accounted for 21% of the frozen imports in 1993. Grouper is increasingly being sold fresh instead of frozen to

Table 6-8
Southeastern U.S. exports[1] of mullet roe.

	Imports		Percent
	1992	1993	change
Fresh			
Value	132	837	534
Volume	13	73	462
Frozen			
Value	8,678	11,336	31
Volume	746	758	2
Total			
Value	8,810	12,173	38
Volume	759	831	9

[1]Values are given in thousands of dollars and volume is given in metric tons.

capitalize on the premium prices that the fresh product attracts.

Mullet Roe: The southeastern United States is the major mullet roe producing area of the world. Mullet roe exports rose in 1993 to 831 (t), valued at $12.2 million, a 38% increase in value (Table 6-8). The great majority of the exports were frozen. Taiwan accounted for 93% of the foreign market, despite a 17.5% tariff. Italy and France comprise the remainder of the market. Mullet roe is a delicacy in the Orient; the peak demand occurs just before the Chinese New Year, when it is a traditional item for personal consumption and gift giving. A small portion of the mullet roe reaches Japan after being processed in Taiwan.

Fresh mullet roe exports, although small when compared to frozen roe exports, showed a dramatic increase. According to industry sources, most of the fresh product is actually "male roe" or testes. This appears to be a rapidly developing market, aided by the advent of more direct airline connections for airfreighting.

Sponges: U.S. sponge exports totaled $2.3 million in 1993 (Table 6-9). This represents a decline of 33% (by value) from 1989 (the first year export data for sponges were collected). Greece was the foreign market leader in 1993, representing 15% of the export market. Other primary foreign markets were Germany, the United Kingdom, Italy, and France. According to sponge wholesalers, about half the market for sponges is overseas and half is domestic. The major change in the industry since 1989 is the fall of Hong Kong as a major market. According to industry sources, Hong Kong switched to other sources of sponges in Cuba and the Bahamas. Exports to Europe, however, increased during the period. Sponge industry leaders believe that exports to Europe could be substantially increased if the 8% European Community tariff were removed.

Table 6-9
Southeastern U.S. exports[1] of dried sponges.

	Imports					Percent
	1989	1990	1991	1992	1993	change
Exports						
Value	3,403	4,712	3,415	2,381	2,275	-33
Volume	171	148	108	142	131	-23

[1]Values are given in thousands of dollars and volume is given in metric tons.

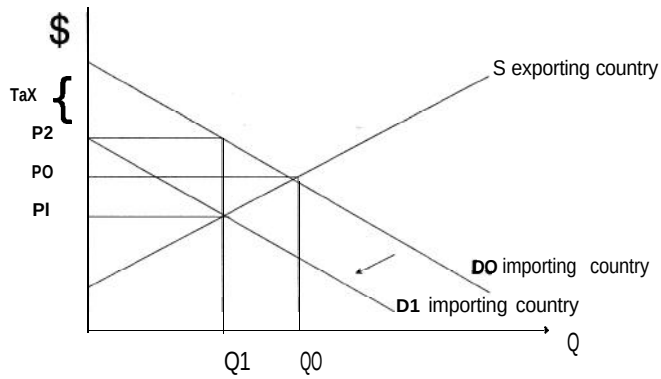
Florida is the only sponge producing state; it established itself as the major supplier of sponges in the world beginning in 1986, when the Mediterranean sponge blight depleted sponges from that important sponge producing area. Sponging primarily occurs in the Florida Keys and along Florida's west coast; Tarpon Springs is the processing and marketing center.

Sponges have a wide variety of manufacturing and medical applications as well as the better known home cleaning uses. The mainstays of the industry are the highly valuable wool sponge and the more common yellow sponge. Sponges have the special ability to regenerate themselves from the stub that remains after harvesting and may be "farmed" by attaching sponge pieces to the bottom.

The Effects of NAFTA on Southeast Region Trade with Mexico

The North American Free Trade Agreement (NAFTA) was implemented on January 1, 1994. It is expected to have a significant effect on the United States' fishery product trade with Canada and Mexico, the cosignatories. In 1993, the U.S. exported $409 million worth of edible fishery products to Canada while importing Canadian product valued at $1,080 million. Exports to Mexico totaled $53 million in 1993, while imports from there were valued at $292 million.

NAFTA may have a more significant impact on trade with Mexico than on trade with Canada because of the preexisting U.S.-Canadian Free Trade Agreement. For this reason and due to geographical proximity, there is special interest in the Southeast Region in the effects of NAFTA on trade with Mexico.



NAFTA: A unit tax shifts the effective demand for a good from DO to D1. Equilibrium price and quantity are reduced to P1 andQ1 when the tax is imposed. At quantity Q1, however, consumers pay price P2(P1 + the tax) while producers receive price P1. The difference is collected by the taxing government for each unit of production up to Q1. The net benefits lost by both consumers and producers are greater than the net benefits gained by the government in tax revenues, so the tax results in a net loss to society.

In 1986, Mexico unilaterally began to reduce its tariffs on fishery products from an average tariff of 50% to 20%. This was done in conjunction with Mexico's accession to the GATT (General Agreement on Tariffs and Trade). With the implementation of NAFTA, Mexican tariffs are being reduced further, many of them immediately, some gradually over 5 or 10 years. These tariff reductions will open up new markets in Mexico to U.S. exporters, as U.S. products become more competitive with Mexican products and similar products entering Mexico from other countries (which are still subject to Mexico's tariffs). Increased demand for U.S. fishery products may also occur due to rising incomes in Mexico, attributable at least in part to the benefits of NAFTA.

Exports of some southeastern U.S. products to Mexico had already begun to increase pre-NAFTA and should accelerate with NAFTA. Large Mexican cities and resorts such as Acapulco and Cancun have been, and increasingly will be, taking advantage of good airline connections to Miami and other southern airports for a dependable supply of high quality fresh and frozen seafood, such as spiny lobster, snapper, and swordfish. Less expensive southeastern U.S. seafood such as mullet, Spanish mackerel, and shark will also find an increasing market in Mexico, according to traders. Companies in the Southeast Region will also export products originating in other regions such as squid, snow crab, and breaded fish portions. Markets may develop for products new to Mexico such as farmed catfish. It is conceivable that even shrimp products will be exported to Mexico, destined for buyers who want, for example, shrimp with special breading not produced in Mexico. This trade will occur in much the same way that Florida shrimp is sold in Louisiana, even though Louisiana is a shrimp producer (and vice-versa). NAFTA is eliminating the requirements to transfer trucked cargo to Mexican carriers at the border, which will enable seafood to be picked up anywhere in the United States and delivered anywhere in Mexico.

Imports from Mexico are not expected to increase dramatically as a result of NAFTA. U.S. tariffs were not a major barrier to trade, since they were low to begin with, usually only a few percent or duty free. For example, shrimp in all forms enters the United States duty free and is subject only to the requirements of the U.S. Food and Drug Administration.

NAFTA liberalizes Mexican regulations that previously limited U.S. (and Canadian) investment and ownership in Mexican companies to 49%, including fishing, seafood processing, and aquaculture sectors. This could potentially provide U.S. and Canadian capital for increased Mexican seafood production and processing, thus increasing the potential for greater Mexican exports to the United States as well as to other countries.

Will U.S. seafood processors relocate to Mexico? The only impetus NAFTA provides is the aforementioned investment/ownership liberalization. "Cheap" labor existed even before was implemented. Factors that favor continued U.S.-based processing are close proximity to raw products and markets and-superior infrastructure. Thus, relocations are expected to be minimal. Overall, it appears likely that U.S. trade with Mexico will be stimulated in both directions, thus fulfilling the goals of NAFTA.

THE RECREATIONAL HARVEST SECTOR

Regional Management Issues

In general, management of the southeastern recreational fisheries is typically driven by biological concerns related to overfished stocks and specific recovery plans. These plans define the total allowable catch (TAC) for the entire fishery, a portion of which is then assigned to both the commercial and recreational sectors in the form of a quota or allocation. Once the recreational allocation is determined, the usual approach is to determine the combination of bag, size, and season limits that is capable of restraining catch to that allocation. Additional implicit suballocations among the various factions within the recreational fishery (private angler vs. for-hire sector, etc.) may then exist through the use of differential size, bag, or seasonal restrictions.

Economics can play a role in the establishment of and change in fishery management measures, as implementation or adjustment of any regulatory measure requires consideration of the resultant impacts on the participants in the fishery. A common concern is how stocks are allocated. The TAC has traditionally been allocated between the commercial and recreational sectors according to historical catch percentages. However, economic theory dictates that scarce resources be allocated to their highest valued uses and historical-based allocations are appropriate only if they truly reflect the value placed on the resource by the various sectors. An example of another issue is the impact of more restrictive bag and size limits. Economic theory would argue that the short-term loss in angler consumer surplus from fewer or less productive trips as a result of a more restrictive fishing environment is justified only if it is exceeded by the benefits of achieving recovered stocks or fisheries.

Answering these questions requires determining the value placed on the resources by the various user groups and examining how these values change. Recreational value takes the form of angler consumer surplus and is often less readily calculated than commercial producer surplus. Few studies exist on the recreational fisheries of the Southeast upon which to demonstrate these changes in value. Thus, economic discussions of the impacts of specific management changes in southeastern recreational fisheries are often limited to theoretical or intuitive descriptions.

A current problem facing management in both the South Atlantic and the Gulf of Mexico subregions is the reliance upon size and bag limits to control catch. Unless bag and size limits are especially severe, catch is likely to exceed targets as these regulations place little restraint on overall effort. Catch performance in a fishery is a function of effort, stock abundance, and catch frequency (the percentage of trips that catch 1, 2, 3, ... fish). These factors are interrelated in a dynamic fashion, each influencing the others. For example, larger stocks produce higher catch frequencies that may attract greater effort into the fishery. If any of these factors are underestimated, catch overruns can occur. Effective management must consider these relationships and account for the impacts of management on angler effort.

Failure to control effort has additional relevance given the current climate to restrict commercial netting operations. Florida recently restricted gill and entangling net activity in state waters, joining the ranks of Texas, Georgia, and South Carolina. Other states are considering similar action to improve the health of the fisheries in their respective waters and out of concern over an influx of displaced netters from Florida. Any biological gains to the stocks of recreational species as a result of such controls may be brief and fleeting, however, as increased effort is applied using other gear types to harvest those fish spared the nets. Simply restricting net use is not a sufficient means of replenishing stocks. Additional controls are required to save the fish and their progeny from anglers on a continuing basis, and this requires controlling catch or effort.

The Gulf of Mexico red snapper recreational fishery provides evidence of the sometimes confounding nature of fisheries management. As stocks improve, it may be necessary to impose increasingly restrictive catch limits to maintain recovery schedules. Recovery schedules typically specify the amount of fish (in pounds) that can be annually harvested from a fishery. As a stock improves, it becomes easier to harvest these fish. Allocations are met sooner. The lack of controls on recreational effort and absence of closure exacerbates the situation and the net effect is that allocations are exceeded, sometimes grossly, as seen in the red snapper fishery. In the absence of closure or effort controls, managers are forced to attempt to control catch through larger minimum sizes and lower bag limits, producing the seemingly per-

verse situation where anglers are allowed to keep fewer fish as they become more abundant.

Finally, management of some Southeast fisheries is complicated by the migratory nature of species. For example, king mackerel catch is controlled in the Southeast by the comanagement of the species by both the South Atlantic and Gulf of Mexico Fishery Management Councils. While the issue of genetic distinction is still unresolved, king mackerel exist in distinct Atlantic and Gulf migratory groups, of which members of the Gulf group migrate into South Atlantic waters during certain times of the year. Quotas are set and managed by migratory group, and the effect of the migrations is that catch in certain months by anglers in some Atlantic coast Florida counties counts towards the Gulf migratory group quota. In other months, catch from the same location counts towards the Atlantic migratory group.

A potential problem resulting from this is that as the fish migrate from one subregion to another, it is possible for anglers in one subregion to catch the quota before anglers in the other subregion have access to the fish. While this is a potential problem with any migratory species, the concern is valid for the mackerel fishery only to the degree that anglers in one subregion deplete the resource, thereby negatively impacting catchability in another subregion, as recreational closure is currently not allowed. Consideration is nevertheless being given by one Council to fix the geographic boundary at one side of Monroe County (the southernmost Florida county) to simplify management. This would result in catch being credited to the subregion in which it occurred regardless of migratory group. Such a realignment has economic implications only if it results in a reallocation of quota from anglers in one subregion to anglers in another subregion and valuation of the resource varies by user group.

Further, this is of concern only if management in one subregion impacts the ability to harvest fish in another. In the absence of closure in the Gulf when the quota is met, no guarantee that Gulf group king mackerel will reach the South Atlantic can be made. Hence, adjusting the regulatory boundaries changes nothing regarding guaranteed access to fish. Original allocations and quotas were made based on biological and not economic concerns and adjusting the regulatory boundary does not alter this arrangement.

Management of South Atlantic Recreational Fisheries

Federally managed species in the South Atlantic[11] are managed through various combinations of size limits, bag limits, permits, quotas, and closed seasons. For example, red drum, striped bass, Nassau grouper, and jewfish are closed to harvest or possession in or from Federally managed waters. Of the other managed fisheries, only two, spiny lobster and summer flounder, currently have seasonal closures.

Current and potential recreational management issues in the South Atlantic include liberalization of the spiny lobster harvest restrictions in areas north of Florida, additional controls on the sale of recreational catch, and reallocation of the Atlantic group Spanish mackerel. A recently passed amendment to the Fishery Management Plan (SAFMC and GMFMC, 1994) for spiny lobster allows a year-round bag limit of two lobsters per person per day in waters north of the Florida-Georgia border. No clearly defined recreational lobster fishery of any consequence exists in these waters. Recreational harvesters currently harvest a small number of spiny lobsters when the season is officially closed. This harvest occurs relatively unencumbered due to an absence of enforcement, a situation reflective of the small stock size, the absence of demonstrated biological significance, and the lack of importance of the fishery relative to others in the area. Thus, there has been no demonstration of lost economic benefits providing the motivation for the amendment; individuals who were aware of the resource and wished to harvest it have done so. Nonetheless, the amendment process moved forward, resulting in regulatory and administrative expenditures that may actually exceed the value of the fishery.

Except for the prohibition of sale of all recreationally caught billfish, Warsaw grouper, and speckled hind, the sale of other species is allowed in the South Atlantic recreational fishery subject to various state regulations. The imposi-

[11]Federally managed species in the South Atlantic recreational fishery include the pelagic species (bluefish, cobia, king and Spanish mackerel, bluefin, bigeye and yellowfin tuna, various sharks, and billfish), and several species in the reef fish complex, including vermillion, red, yellowtail and other snappers, black, gag, red and other groupers, black seabass, red porgy, and greater amberjack. Additionally, red drum, striped bass, spiny lobster, and summer flounder are regulated species.

tion of additional Federal controls on such activity was expected to be discussed by the SAFMC in 1995, but no specific limitations were then being processed. The economic rationale behind prohibiting sales of recreational catch is that: 1) harvest pressure is reduced through the elimination of the sales incentive to fish; 2) commercial closures are not accelerated due to recreational sales counting towards the commercial quota; and 3) monitoring and enforcement costs are reduced as the distinction between commercial and recreational effort becomes more clearly defined.

In the Spanish mackerel fishery, the current commercial:recreational allocation is 50:50. In recent years, however, the recreational sector has not harvested its quota, and an increase in the commercial allocation is being considered. From an economic perspective, such a reallocation must consider whether the recreational sector's failure to harvest the quota is due to circumstance or design (cannot harvest vs. do not care to harvest), and must additionally consider the impacts of additional commercial quantities on industry profitability. Typically, a reallocation is justified if the gain in surplus by one sector (commercial) exceeds that lost by the other sector (recreational). Currently, however, no evidence exists to suggest that the recreational sector is precluded from catching their allocation of Spanish mackerel and, hence, no loss in consumer surplus would be expected in the recreational sector should reallocation occur.

Management of Gulf of Mexico Recreational Fisheries

As in the South Atlantic, federal management of recreational species in the Gulf of Mexico[12] is done through various combinations of size limits, bag limits, and closed seasons. For example, red drum and jewfish are closed to harvest or possession in or from Federally managed waters. Of the other managed species, only the stone crab and spiny lobster fisheries have programmed seasonal closures, although the bluefin tuna fishery is subject to closure upon meeting the quota.

Current recreational management issues include reduced bag limits and increased minimum size requirements for red snapper due to recent harvest overruns. The recreational fishery exceeded its quota by 93% in 1992 and 88% in 1993. The Gulf of Mexico Fishery Management Council (GMFMC, 1994) approved a reduction in the bag limit from 7 fish to 5 fish, and an increase in the minimum legal size from 14 inches total length to 15 inches. These changes are motivated by a desire to accomplish the biological goals of stock recovery. Although economic considerations are important in determining the proper mix of management adjustments, inadequate knowledge of the impacts of specific management changes precludes precise analysis. Of specific importance is the impact of management changes on the number of trips demanded and the resultant change in net economic benefits. These effects are currently being examined for Gulf of Mexico reef fish by researchers at the University of Florida, but results are as yet unavailable.

These relationships have been studied for Gulf of Mexico group king mackerel. Using 1990 and 1991 Marine Recreational Fisheries Statistics Survey data, Milon[13] found no statistical support for a positive relationship between king mackerel catch rates and days fished. Milon further suggested that king mackerel bag limits may have contributed to increased catch rates and increases in king mackerel target effort. This is not wholly inconsistent with logic in that limiting individual catch should both allow stock improvement and increase the availability of fish for other anglers, thereby increasing individual catch rates and attracting effort. Additionally, the very existence of the regulations may produce the perception that the stocks are being better managed, thus attracting additional effort. Nevertheless, few studies currently exist on which to base estimates of the change in recreational benefits resulting from various management measures.

[12]Federally managed species in the Gulf of Mexico recreational fishery include pelagic species (e.g., cobia, king and Spanish mackerel, various billfish, tuna and sharks), and several species in the reef fish complex including red, vermillion, lane and other snappers, black, red, gag and other groupers, black seabass, jewfish and greater amberjack. Additionally, red drum, stone crabs, spiny lobster and coastal sharks are regulated.

[13]Milon, J. W. 1993. A study of recreational demand for Gulf of Mexico group king mackerel using 1990 and 1991 MRFSS data. Final Rep. Prep. for Gulf Mex. Fish. Manage. Counc., Tampa, Fla.

Summary Statistics

Figures 6-9—6-15 and Table 6-10 provide summary statistics on effort and catch in the southeastern U.S. recreational fishery for 1983-93. Figure 6-9 shows total participants by subregion. Its most notable feature is the shift in dominance in recent years of total South Atlantic participants over total Gulf of Mexico participants. Total trips have been roughly equal in both areas. Figure 6-10 depicts the cyclical nature of total trips by subregion, a phenomenon more clearly seen in Figures 6-11 and 6-12 which additionally depict total trips by mode. Total trips peak in 1985, 1988, and 1991, or every 3 years, in both subregions. Both subregions also show a downward trend in total trips. Shore fishing dominates effort in the South Atlantic. Private/rental boat fishing holds the edge in the Gulf of Mexico, though the lead is less distinct than that seen in the South Atlantic. Total charter trips have been relatively stable in both subregions since 1987, while total shore and private/rental boat trips have followed cyclical patterns.

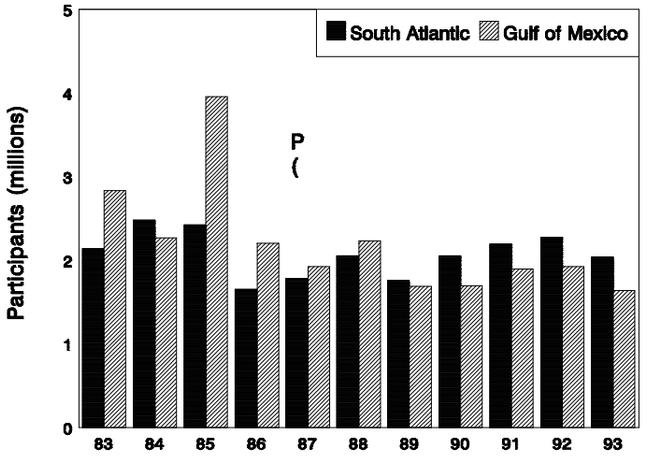


Figure 6-9
Number of participants, Southeast recreational fishery, 1983-93.

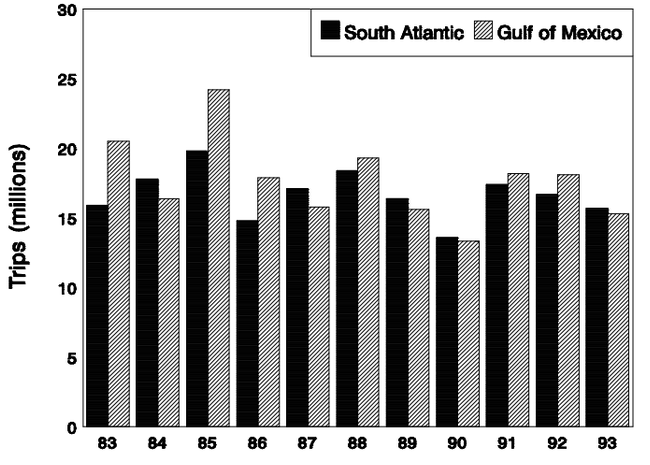


Figure 6-10
Number of trips, Southeast recreational fishery, 1983-93.

Table 6-10
Top five species caught (in millions of fish) in the southeastern United States in 1983 and 1993 by subregion.

	South Atlantic			
	1983		1993	
Rank	Species	Catch	Species	Catch
1	Bluefish	10.0	Spot	5.2
2	Spot	8.8	Bluefish	2.8
3	Black sea bass	5.0	False pilchard	2.8
4	Atlantic croaker	4.4	Pinfish	2.7
5	Saltwater catfish	3.0	Atlantic croaker	2.7

	Gulf of Mexico			
	1983		1993	
Rank	Species	Catch	Species	Catch
1	Saltwater catfish	20.4	Scaled sardine	20.2
2	Spotted seatrout	14.1	Spotted seatrout	16.5
3	Atlantic croaker	11.6	Hardhead catfish	7.7
4	Herrings	8.2	Red drum	5.5
5	Sand seatrout	5.0	White grunt	4.1

Figure 6-13 shows total southeastern U.S. catch by subregion. The most remarkable point is the dominance of Gulf of Mexico catch over that of the South Atlantic. Since 1988, total catch in the Gulf of Mexico has been 2-3 times that of the South Atlantic. Further, while total catch in both subregions shows the same cyclical patterns as total effort, total catch has shown a downward trend in the South Atlantic and an upward trend in the Gulf of Mexico. Average catch per trip has remained stable at approximately three fish per trip since 1987 in the South Atlantic, while catch in the Gulf of Mexico has increased, from six fish per trip in 1987 to over eight fish per trip in 1993. Performance in the South Atlantic might suggest stable stocks, while the improving performance in the Gulf of Mexico could suggest improved stocks or increased awareness of exploitable species. Such determinations, however, would require examinations of the species composition of catch as, despite the appearance of stability or improvement, certain species may in fact be in decline while other more accessible but less desirable species are substituted.

Table 6-10 addresses this last issue somewhat by showing a comparison of the top five species in terms of number of fish caught in 1983 and 1993 for both subregions. The South Atlantic showed more stability with three species (bluefish, spot, and Atlantic croaker) remaining in the top five over the time period, but each of the three species experienced a 39% or greater decline in catch. This would suggest that anglers are targeting the same species, but declining stocks make the stocks less accessible. In the Gulf of Mexico, only saltwater catfish and spotted seatrout retained their top five rankings. Although catfish catch declined, spotted seatrout catch increased despite declines in total trips, suggesting a shift in targeting behavior. Shifts in target activity are further evidenced by the presence of scaled sardine, a baitfish, as the dominant species in the Gulf of Mexico in 1993. The implications of these target shifts is that they demonstrate the increasingly adaptive ability of anglers to specialize and target specific species. Anglers are better able to selectively target individual species and are thus less subject to random catch. Fisheries management must acknowledge this and respond with rules that simultaneously address the species of concern as well as the potential repercussions in other related species.

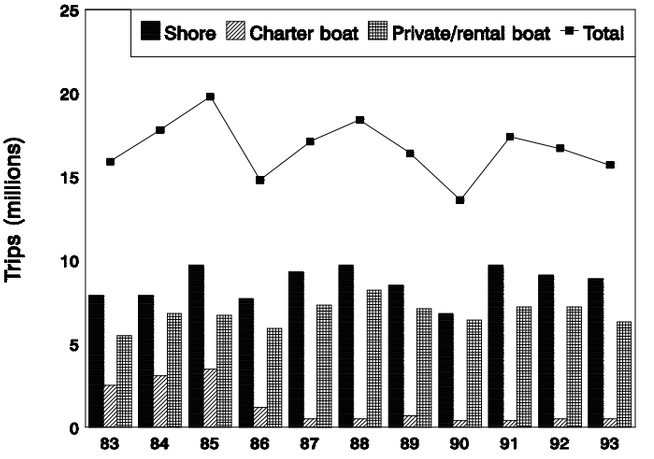


Figure 6-11
Number of trips by mode, South Atlantic recreational fishery, 1983-93.

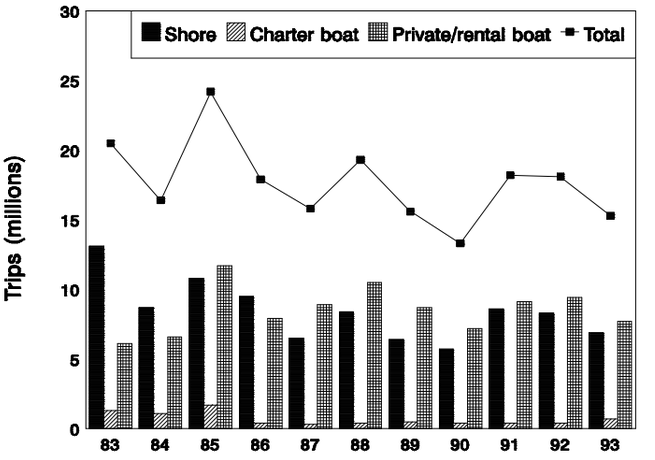


Figure 6-12
Number of trips by mode, Gulf of Mexico recreational fishery, 1983-93.

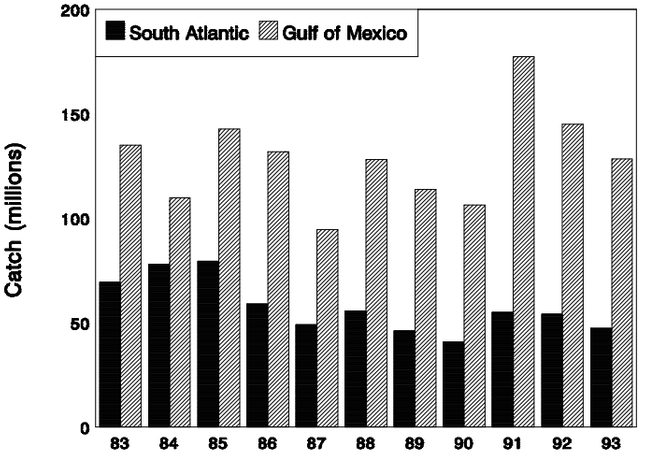


Figure 6-13
Total catch, Southeast recreational fishery, 1983-93.

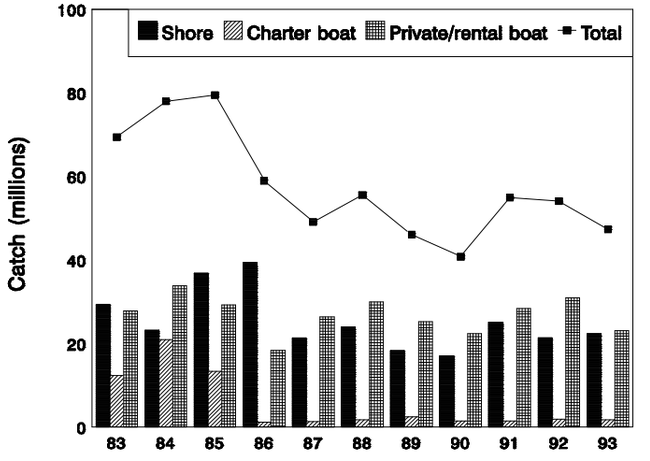


Figure 6-14
Total catch by mode, South Atlantic recreational fishery, 1983-93.

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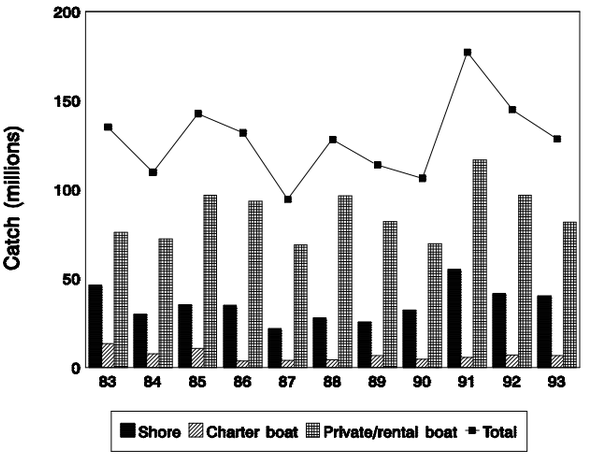

Figure 6-15
Total catch by mode, Gulf of Mexico recreational fishery, 1983-93.